

PATENT SPECIFICATION

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(54) A METHOD FOR THE MANUFACTURE OF SODIUM CHLORIDE OR BRINE AND/OR CAUSTIC SODA AND ENGINEERING BRICK FROM ALUMINA PLANT RED MUD

(71) We, THE UNIVERSITY OF GUYANA, a body corporate as constituted by the Legislature of British Guiana Ordinance No. 6 of 1963, as amended by Ordinance No. 5 of 1965, of Turkeyen Campus, Greater Georgetown, Guyana (box 841), and GREGORY ONYEMAUWA IWU, a national of Nigeria, of 7 Enachu Street, Section K, Campbellville, Georgetown, Demerara, Guyana, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to the manufacture of sodium chloride or brine and/or caustic soda, and engineering brick from alumina plant red mud, a waste product in the manufacture of alumina or metal grade bauxite.

Alumina plant red mud presents a storage problem when discharged into ponds and pollution hazards when discharged into rivers or onto land employed for agricultural purposes. Hence the development of a technology that directly utilizes the alumina plant red mud is of economic as well as ecological significance. The main mineral ingredients of typical Guyana bauxites alumina plant red mud (dry solid basis) are Fe₂O₃ (12 wt %), SiO₂ (23 wt %), Al₂O₃ (31 wt %), TiO₂ (10 wt %) and Na₂O (12 wt %). Hitherto, when the Guyana bauxite alumina plant red mud or any alumina plant red mud for that matter, is treated with either sulphuric or hydrochloric acid solution it yields a solution containing the sulphates or the chlorides respectively of iron, aluminium, titanium and sodium. In the process of the present invention, sodium is selectively abstracted into solution from the alumina plant red mud, as sodium chloride, without bringing down or contaminating the solution with the chlorides of iron, titanium, silicon and aluminium. A concentrate of this solution is brine which is the basic material for the electrolytic production of caustic soda. The residual alumina plant red mud from the

above, free from sodium, may be used for the production of an engineering brick. Hitherto, the relatively high proportion of soda in the alumina plant red mud, has rendered the latter unsuitable material for making an engineering brick.

According to the present invention, there is provided a process for the production of sodium chloride as brine from alumina plant red mud which comprises heating alumina plant red mud in the presence of hydrochloric acid, said hydrochloric acid being added to attain pH of 5.5 to 6, and separating the solids from the liquid phase. Solid sodium chloride can be recovered by evaporating the brine.

From a further aspect there is provided a method for producing engineering bricks (i.e. high load bearing) which comprises addition of kaolinitic clay to the residual solid from the reclamation process of the invention and firing at temperature between 1090 and 1150°C. Engineering bricks have a high compressive strength and are bricks intended for high load bearing applications.

Such bricks may have compressive strengths of 7×10⁷ Nm⁻² (approximately 10,000 psi) and average water absorption less than 1.4% by weight.

In the process of the invention alumina plant red mud which may already be in the form of slurry is used. Preferably the alumina plant red mud is dried at about 115°C, and then made into an aqueous slurry or mud. This mud is then heated, normally into the range 70–80°C and the pH adjusted to between 5.5 and 6 by the addition of hydrochloric acid, this addition being accompanied by vigorous agitation. The control of the addition of hydrochloric acid to attain the desired pH may be effected by means of a suspended titration or any other convenient means. Once this pH has been attained the suspension is allowed to cool and settle the solid and liquid phases separated by decantation or filtration.

The filtrate on evaporation to dryness usually yields on the average 12 parts by

and then made into an aqueous slurry prior to treatment with hydrochloric acid.

5 5. A process according to any of the preceding Claims wherein the separation of the solid and liquid phases is effected by decantation.

10 6. A method for producing engineering bricks which comprises the addition of kaolinic clay to the residual solid from the process according to Claim 1, shaping and firing at temperature between 1090 and 1150°C.

7. A method for the treatment of alumina plant red mud substantially as described herein in Example 1.

15 8. A method for the production of bricks

substantially as described herein in either of Examples 2 and 3.

9. Bricks whenever produced by the method of either of Claims 6 and 8.

10. Brine whenever produced by the process of any of Claims 1 to 5 and 7. 20

11. Caustic soda whenever obtained by concentration and electrolysis of brine as claimed in Claim 10.

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